

IEEE ALMANACK

 INSTITUTE OF ELECTRICAL AND ELECTRONICS ENGINEERS

VOL. 11, NO. 8, APRIL, 1967, PHILADELPHIA

SPRING JOINT COMPUTER CONFERENCE

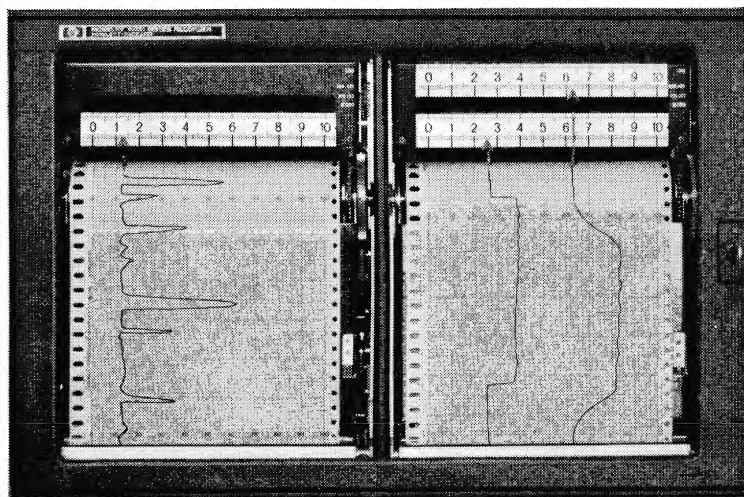


"Say, Forbes—Take 14 years and check this answer."

APRIL, 1967

MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRI./SAT.
				1. Meet-the-Engineer Radio Program
3. SECTION TGBS	4. TGSPD 1A GEM EW S	5. GCT	6. GR Women's Auxiliary	7.
10. GIT GCT/V	11. TGPSE GB/BTR GA	12. GC GPMP	13.	8. Meet-the-Engineer Radio Program
17. TGSIO GAC	18. TGTD	19. GIM	20. GAES	14. Dinner Dance
24.	25. Jewish Passover	26.	27.	21. TGMT
				22. Meet-the-Engineer Radio Program
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GOOD BYE DOWN TIME



these new
strip-chart
recorders take
the downtime
out of
industrial
recording

Four new strip-chart recorders are now available from Hewlett-Packard; 6-inch one or two pen models and 11-inch one or two pen models. Design techniques including solid-state circuits and precision reference allow reliable, trouble-free operation. True modular design makes possible rapid interchange of modules on line with minimum downtime. Oversized inkwells and disposable pen tips provide inexpensive writing convenience. (Or you can have inkless writing on inexpensive electrosensitive paper for long-term unattended monitoring applications.)

The modular design also lets you order a low-cost recorder that is tailor-made to fit your application. You have a choice of sensitivity and speed.

As options you can use up to 6 limit switches, electric pen lift, event markers, and retransmitting pots. Other options include air purge, individual-remote pen lift, remote chart drive, electric writing, and jump speed chart drives. Two 6-inch instruments may be mounted side by side in a single 19-inch relay rack.

Standard features include guarded and floating inputs with high CMR and solid-state construction with zener reference. The

removable chart magazine tilts out 45° for easy notations and front loading.

It all adds up to recorders that stay on the job, not the repair bench.

Call your Hewlett-Packard field engineer for complete information. Or write Hewlett-Packard, Palo Alto, California 94304, Tel. (415) 326-7000; Europe: 54 Route des Acacias, Geneva. *Data subject to change without notice. Prices f.o.b. factory.*

SPECIFICATIONS

Sensitivity: Choice from 1 mv to 100 v full scale
Chart Speed: Choice from 0.5 in/hr to 10 in/min
Accuracy: 0.25% with 0.5 second balance time
Input Impedance: Potentiometric 1 mv to 100 mv; constant 1 MΩ above 100 mv

Prices:	6-Inch Recorders	11-Inch Recorders
Single pen:	5701A \$ 825.00	5703A \$ 995.00
Dual Pen:	5700A \$1325.00	5702A \$1895.00

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An extra measure of quality

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IEEE ALMANACK



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PHILADELPHIA SECTION OFFICE

The Institute of Electrical and Electronics Engineers, Inc., Philadelphia Section, The Moore School of Electrical Engineering, University of Pennsylvania, Phila., Pa. 19104. Miss Helen B. Yonan, Office Manager. Tel. Nos. 594-8106; 594-8134; if no answer, call 594-8100.

In recognition of the Spring Joint Computer Conference in Atlantic City, April 18-20, this month's *ALMANACK* features Conference news and computer-oriented articles contributed by Delaware Valley firms. More than 5,000 persons in the computer field, and over 100 exhibitors will convene. An estimated \$35 million worth of advanced computer equipment will be displayed at Atlantic City's Convention Hall.

Of the 34 technical sessions that form the heart of the Conference, nearly all are involved with uses of computers and methods of instructing them to process information faster, better or in a new way, according to Technical Program Chairman Paul Chinitz of the Univac Division, Sperry Rand Corporation.

He said the sessions will cover four major areas: hardware devices; logic and computer organization; programming and applications; and analog/hybrid systems.

Rep. Cornelius E. Gallagher and Major General John W. O'Neill, chief of the Air Force Electronic Systems Division at L. G. Hanscom Field, Massachusetts, will be the featured speakers.

General O'Neill, the main banquet speaker April 19, will discuss user-oriented computer technology before the conference delegates at the Chalfonte-Haddon Hall Hotel.

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INSTITUTE OF ELECTRICAL AND ELECTRONICS ENGINEERS

ALMANACK

APRIL, 1967 VOL. 11, No. 8

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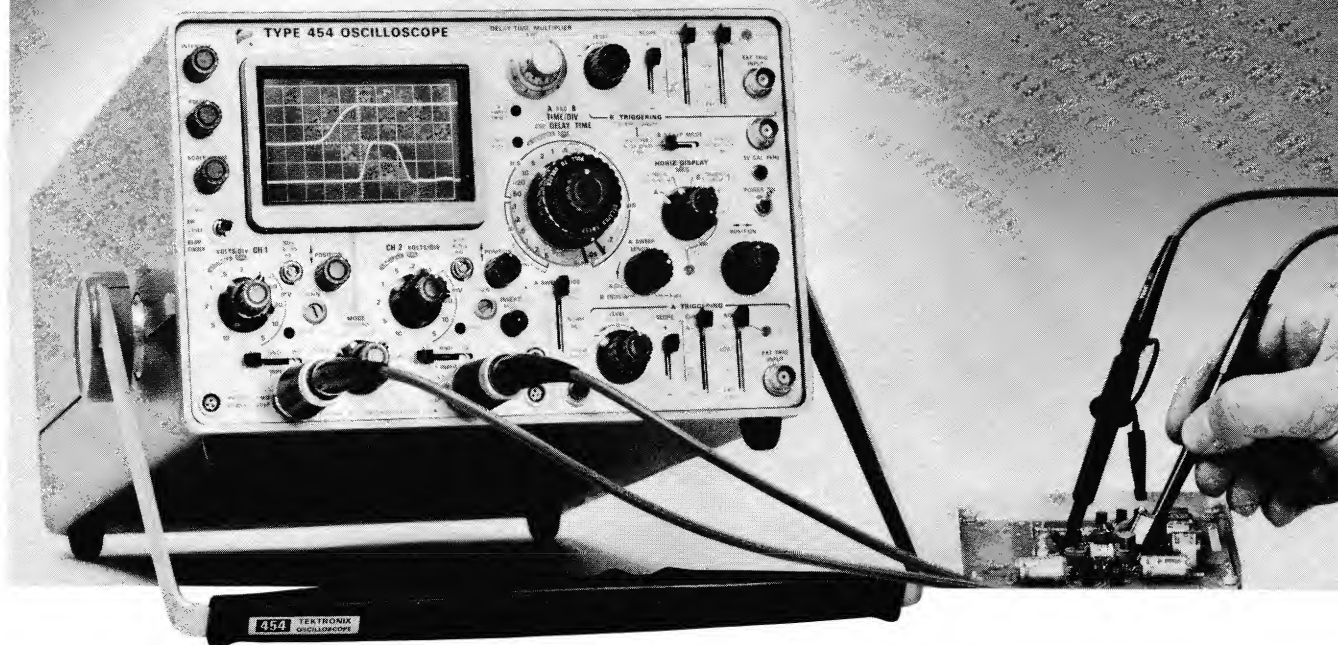
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150 MHz, 2.4 ns

NOW! at the probe tip



The Tektronix Type 454 is an advanced new portable oscilloscope with DC-to-150 MHz bandwidth and 2.4-ns risetime performance where you use it—at the probe tip. It is designed to let you make convenient measurements of fast-rise pulses and high-frequency signals previously outside the range of conventional oscilloscopes.

The Type 454 is a complete instrument package with dual-trace vertical, high-performance triggering, 5-ns/div delayed sweep and solid-state design, all in a rugged 31-lb. instrument. You also can make 1 mV/div single-trace measurements and 5 mV/div X-Y measurements with the Type 454.

The 2.4-ns risetime and DC-to-150 MHz bandwidth are specified at the tip of the new miniature P6047 10X Attenuator Probe. The dual-trace amplifiers provide the following capabilities with or without probes:

Deflection Factor*	Risetime	Bandwidth
20 mV to 10 V/div	2.4 ns	DC to 150 MHz
10 mV/div	3.5 ns	DC to 100 MHz
5 mV/div	5.9 ns	DC to 60 MHz

*Front panel reading. Deflection factor with P6047 is 10X panel reading.

The Type 454 features a new CRT with distributed vertical deflection plates and a 14-kV accelerating potential. It has

a 6 by 10 div (0.8 cm/div) viewing area, a bright P-31 phosphor and an illuminated, no-parallax, internal graticule. The Type C-30 and the New Type C-40 (high writing speed) cameras mount directly on the oscilloscope.

The instrument can trigger to above 150 MHz internally, and provides 5-ns/div sweep speeds in either normal or delayed sweep operation. The calibrated sweep range is from 50 ns/div to 5 s/div, extending to 5 ns/div with the X10 magnifier. Calibrated delay range is from 1 μ s to 50 seconds.

The Type 454 is designed to be carried and has the rugged environmental characteristics required of a portable instrument. A rackmount, the 7-inch-high Type R454 oscilloscope, is available with the same high performance features. Also available is the new Type 200-1 Scope-Mobile® Cart.

For further information about the Type 454, or about the new Tektronix DC-to-100 MHz *plug-in* oscilloscope, the Type 647A, contact your nearby Tektronix field engineer, or write: Tektronix, Inc., P. O. Box 500, Beaverton, Oregon 97005.

Type 454 (complete with 2 P6047 Probes and accessories)	\$2550
Type R454 (complete with 2 P6047 Probes and accessories)	\$2635
C-30 Camera	\$ 390
C-40 Camera	\$ 540
Type 200-1 Scope-Mobile® Cart	\$ 60

U.S. Sales Prices FOB Beaverton, Oregon



Tektronix, Inc. PHILADELPHIA FIELD OFFICE
126 PRESIDENTIAL BLVD. NORTH • BALA-CYNWYD, PA. • Phone: Tennyson 9-3111



WHAT IF PHILADELPHIA HAD A POWER BLACKOUT?



Eugene S. Wheeler

The April 3, 1967 main Section Meeting should be, despite its topic, especially illuminating. The subject should remind us of the November 1965 nightmare that plunged the Northeastern section of our Country in darkness and chaos. Some people feel that it could happen here in the Delaware Valley.

What has been done to avoid such an occurrence?

What measures have been taken to minimize the tumult if the disaster occurs?

Come out to the April 3rd meeting and find answers to these and other timely questions.

The panel members will include:

EUGENE S. WHEELER — Mr. Wheeler started with Bell of Pennsylvania in 1949 after graduating from Penn State in electrical engineering. After several assignments in engineering in Harrisburg, he went to the Bell Telephone Laboratories in 1956 where he was a member of the technical staff in the Telegraph and Special Systems Development Department. In 1960 Mr. Wheeler returned to Bell of Pennsylvania in Harrisburg to further assignments in Equipment and Buildings Engineering.

He joined the staff of the Bell System Data Communications Training Program at Cooperstown, New York, in 1963 where he was responsible for instruction in Computer Concepts, Switching Systems and Systems Design. Following this assignment he returned to Bell of Pennsylvania

Headquarters early in 1965. His present position as General Military and Special Services Engineer includes responsibility for military communications, switched networks (both government and civil), FAA services, Civil Defense and Security, and the Company Engineering School. He is a registered professional engineer in Pennsylvania. Mr. Wheeler is a member of IEEE, having served as chairman of the Susquehanna Section, and is also a member of the Engineer's Club of Philadelphia, of Eta Kappa Nu and Tau Beta Pi.

SAMUEL S. BAXTER — Mr. Baxter is the Commissioner and Chief Engineer for the Philadelphia Water Department. He also serves as the Emergency and Disaster Coordinator for the City of Philadelphia. His entire career, which began in 1923, has been with the engineering departments of the City.

Mr. Baxter is a Fellow of the American Society of Civil Engineers, Past President of the American Water Works Association, Past President of the American Public Works Association, Past President of the Engineers' Club of Philadelphia, and a Member of the Pennsylvania Society of Professional Engineers. He is a graduate of Drexel Institute of Technology and holds an Honorary Doctor of Engineering degree from Drexel.

RICHARD HOLGATE — Mr. Holgate is the Superintendent of the System Operation Division of the Philadelphia Electric Company. His career with Philadelphia Electric Company spans 41 years; he has worked as a



Samuel S. Baxter

Power Switchboard Operator, Load Dispatcher, and as Senior Engineer in the Economy Division.

He is a graduate of Drexel Institute of Technology and a member of the IEEE.

Date:

Monday, April 3, 1967

Place:

Philadelphia Electric Co.
Auditorium

Time:

6:00 P.M. Dinner
7:45 P.M. Meeting

Dinner Place:

Engineers' Club
1317 Spruce Street
Price: \$4.00

Topic:

What if Philadelphia Had a
Power Blackout?

Speaker:

Panel including:
Samuel S. Baxter
Richard Holgate
Eugene S. Wheeler

MAIL by March 31, 1967 to:

Miss Helen Yonan

IEEE Office

Moore School of E.E.

University of Pennsylvania

Philadelphia, Pa. 19104

Please reserve _____ places for the IEEE Section Meeting on April 3, 1967 at the Philadelphia Electric Company, 9th and Sansom Streets, Philadelphia.

Name _____

Address _____

Meetings

AIR POLLUTION

Larry Himmelstein

Monday, April 3, 8 P.M.

Technical Group on Basic Science

David Rittenhouse Lab., Aud. A-1
33rd & Walnut Streets

Mr. Himmelstein is Acting Chief of Air Pollution Control Center in the City of Philadelphia. He received a degree in Chemical Engineering from Penn State University in 1952. Since 1954 he has been engaged in the fields of Air Pollution Control and Industrial Hygiene.

Urban areas and industrial communities are faced with high levels of pollution of the air we breathe. Philadelphia is among those having this problem. Mr. Himmelstein will present the problem in terms of a system viewpoint: what are the contaminants; what are the danger levels; how are these contaminants identified and measured? How are the sources identified and what is the approach to solving the problem of eliminating or reducing the contaminants?

Dinner and

Cocktails: 6 P.M.

Faculty Club, 36th & Walnut Streets

Reservations: Call Miss Helen Yonan

IEEE Office, 594-8106 or 8134

Free Parking: Lot on Walnut Street at 33rd Street.
Entrance on Walnut Street.

MEETINGS

J. J. Gillespie

IN-PLANT TECHNICAL LECTURES:

How to Get Your Engineers Talking to One Another

Tuesday, April 4, 8 P.M.

Cherry Hill Inn

Rt. 38 and Haddonfield Rd.

Cherry Hill, N. J.

Joint meeting of the Groups on Engineering Management and Engineering Writing and Speech.

Mr. Gillespie, Engineering Editor in the Communications Group at RCA in Camden, New Jersey, will describe a lecture program which he directs there. This program was designed to provide a means and to encourage engineers to communicate with their colleagues the latest advances and data in the engineering fields. The participating engineers, usually in-plant personnel, are briefed on the art of public speaking, rehearsed, and presented to an audience of their colleagues in a healthy audience participation atmosphere. The results are better engineer-speakers, better informed engineers, and group motivation. Mr. Gillespie's basic premise is that a lecture series of this sort, while extremely effective, is relatively simple to implement.

Dinner: 7 P.M., Main Dining Room

Cherry Hill Inn

Reservations: Call Miss Helen Yonan (BY MARCH 28)

IEEE Office, 594-8106 or 8134

SOLID STATE TRIP DEVICE FOR LOW VOLTAGE POWER CIRCUIT BREAKERS

D. C. Hoffman

P. J. Reifschneider

Tuesday, April 4, 7:30 P.M.

Engineers' Club Conference Room
1317 Spruce Street

Joint meeting of the Groups on System Protection and Operation and Industry Application.

The speakers are Application Engineers at the General Electric Company and will describe the features and applications of the new devices.

Dinner: 6 P.M.

Philadelphia Room, Engineers' Club

Reservations: Call Miss Helen Yonan

IEEE Office, 594-8106 or 8134

COMPUTER AIDED DESIGN, PRESENT AND FUTURE

Dr. M. S. Corrington

Wednesday, April 5, 7:30 P.M.

David Rittenhouse Lab., Aud. A-4
33rd & Walnut Streets

Group on Circuit Theory

Dr. Corrington is Leader of Computer Application, Applied Research Defense Electronics Products at RCA in Camden, New Jersey. He will discuss examples of the types of circuit problems especially suited to computational techniques; such as simulation, noise, tolerances, etc. Applications to the design of integrated circuits will be covered with emphasis on the revolutionary effects of these techniques on the future of circuit design.

Dinner: 6 P.M.

Faculty Club, 36th & Walnut Streets

Reservations: Call Miss Helen Yonan

IEEE Office, 594-8106 or 8134

ELECTION OF OFFICERS for Group on Circuit Theory is scheduled for this meeting.

HIGH TEMPERATURE TESTING AND FAILURE ANALYSIS OF INTEGRATED CIRCUITS

Edward Doyle

RELIABILITY CHARACTERISTICS OF INTEGRATED CIRCUITS

Bernard Tiger

Thursday, April 6, 8 P.M.

Presidential Apartments

City Line & Presidential Blvd.

Group on Reliability

Mr. Doyle is Electronic Engineer Investigating Failure Mechanisms of Solid State Devices Reliability Physics Section, Reliability Branch at Rome Air Development Center in Rome, New York. He will discuss the results of a test and failure analysis program to evaluate effectiveness of burn-in.

Mr. Tiger is Product Assurance Consultant at RCA, Camden, New Jersey. A test program will be described which shows that integrated circuit reliability is a function of (1) screening effectiveness, (2) the failure mechanisms which exist in field use devices and (3) the life distributions and environmental susceptibilities of

devices having failure mechanisms.

Dinner: 7 P.M. Cocktails: 6 P.M.

Reservations: Call Miss Helen Yonan
IEEE Office, 594-8106 or 8134

FLYING SAUCERS—FACT OR FANCY?

Thursday, April 6, 12 Noon

Engineers' Club
1317 Spruce Street

Women's Auxiliary to IEEE

A scientist from General Electric Company will discuss his views of this popular subject.

The regular business meeting will be held at 11:30 A.M. The Nominating Committee will present its report. Also included will be the presentation of the Education Award to the Moore School of Electrical Engineering of the University of Pennsylvania.

Officers for the ensuing year will be elected.

For reservations Mrs. W. E. Scholz

call or write: 335 Cherry Lane, Havertown, Pa.
(Luncheon \$2.50) HI. 9-0420

SHIPBOARD ELECTROMAGNETIC COMPATIBILITY, Part I

Group Discussion

Moderator: J. J. Stewart

Saturday, April 8, 8:45-9:00 A.M. (NOTE NEW TIME)

MEET-THE-ENGINEER Radio Program

This program together with the one scheduled for April 22 will be in the form of a round table discussion of the problems encountered on shipboard surrounding compatibility of electromagnetic waves, such as interference to all forms of communications, their major problem areas and present solutions and techniques.

The program will be broadcast on WFLN-900 KC/AM and 95.7 MC/FM.

ANALOG MODULATION: BOUNDS AND SYSTEM PERFORMANCE

Dr. H. L. VanTrees

Monday, April 10, 7:45 P.M.

David Rittenhouse Lab., Aud. A-1
33rd & Walnut Streets

Groups on Information Theory and Communication Technology/Vehicular Communications

Dr. VanTrees will present the problem of transmitting analog information over an additive Gaussian noise channel in a tutorial manner. Performance bounds based on rate-distortion curves will also be presented.

Typical transmission systems include continuous schemes such as FM and optimum angle modulation; sampled schemes such as PAM, PFM, and PAM-FM; and quantized schemes such as PCM and coded PCM. The performance of some of these typical systems will be compared to the rate-distortion bounds.

Cocktails and

Dinner: 6 P.M.

Faculty Club, 36th & Walnut Streets

Reservations: Call Miss Helen Yonan

IEEE Office, 594-8106 or 8134

Free Parking: Lot on Walnut Street at 33rd Street.

TRANSISTORIZED HI-FIDELITY SYSTEMS

Harry Dow

Tuesday, April 11, 8 P.M.

Philco-Ford Micro-Electronics Div.
Blue Bell, Pa.

Joint meeting of the Groups on Broadcasting/Broadcast Transmission Receivers and Audio

Mr. Dow is Supervisor, Hi-Fidelity Design at Philco-Ford Company.

Dinner: 6 P.M.

William Penn Inn, Junction of Rt. 202
and 73.

Reservations: Call Miss Helen Yonan

IEEE Office, 594-8106 or 8134

MUDDY RUN PUMPED STORAGE PROJECT ELECTRICAL AND OPERATING ASPECTS

J. J. Ferencsik

Tuesday, April 11, 7:30 P.M.

Engineers' Club, Committee Room C
1317 Spruce Street

Technical Group on Power System Engineering

Mr. Ferencsik is Project Engineer with the Philadelphia Electric Company and will discuss the electrical characteristics and the operating aspects of the Muddy Run Pumped Storage Station, soon to be added to the Philadelphia Electric Company System.

Dinner: 6 P.M.

Philadelphia Room of the Engineers' Club

Reservations: Call Miss Helen Yonan

IEEE Office, 594-8106 or 8134

DIRECT DIGITAL CONTROL

Donald Ham

Richard Skinner

Wednesday, April 12, 8 P.M.

Engineers' Club, Committee Room C
1317 Spruce Street

Group on Computers

Mr. Ham, Digital Systems Division Manager, Fischer & Porter, will describe how and under what circumstances direct digital control can be made to "pay back" the investment it requires. Mr. Skinner, Project Head of Direct Digital Control System Development at Leeds & Northrup will discuss the advantages of a Direct Digital Control System employing a powerful general purpose digital computer. Particular emphasis will be given to the system flexibility useful both in the systems construction phase and in the operating phase.

Dinner: 6:30 P.M.

Philadelphia Room, Engineers' Club

Reservations: Call Miss Helen Yonan

IEEE Office, 594-8106 or 8134

(Continued on page 8)

RELAYS, THEIR USE AND MANUFACTURE

John Dunn

Wednesday, April 12, 8 P.M.

Struthers-Dunn Company
Lamb Road, Pitman, N. J.

Group on Parts Materials and Packaging

The use and manufacture of relays will be the subject of this meeting. Included on the agenda will be an orientation lecture by Mr. Dunn and an interesting tour of the manufacturing facility.

Dinner: (Place and time not yet known)

For Further

Information and Call Miss Helen Yonan

Reservations: IEEE Office, 594-8106 or 8134

GRADIENT TECHNIQUES FOR DESIGN OPTIMIZATION

R. R. Duersch

Monday, April 17, 7:30 P.M.

David Rittenhouse Lab., Aud. A-1
33rd & Walnut Streets

Group on Automatic Control

Mr. Duersch is Systems Analysis Engineer, Research & Development Center, at General Electric Company.

Gradient techniques and similar procedures may be used to improve engineering automatically adjusted in a computer simulation of the design problem to optimize a selected criterion. Many of these techniques are simple, but effective, and can significantly reduce the engineering time required to complete a design. A number of these procedures and their characteristics will be discussed, and several applications described.

Dinner: 6 P.M.

Faculty Club, 36th & Walnut Streets

Reservations: Call Miss Helen Yonan

IEEE Office, 594-8106 or 8134

CAPACITORS—FRIEND OR FOE

F. R. Solis

Monday, April 17, 7:30 P.M.

Engineers' Club, Committee Rm. C
1317 Spruce St.

Technical Group on Subways, Indoors and Out

Mr. Solis is Supervising Engineer at the Philadelphia Electric Company and will discuss the hazards both real and imaginary in power system application of shunt capacitors.

Dinner: 6:30 P.M.

Philadelphia Room, Engineers' Club

Reservations: Call Miss Helen Yonan

IEEE Office, 594-8106 or 8134

DEVELOPMENT OF SOLID STATE HIGH VOLTAGE DC CONVERTER

C. G. Dewey

Engineers' Club, Committee Rm. C
1317 Spruce St.

Tuesday, April 18, 7:30 P.M.

Technical Group on Transmission and Distribution

Mr. Dewey is Project Engineer at General Electric Company, and will describe a development and test program of a HVDC converter, consisting of solid state valves, hydrogen suppressors, and systems controls.

Dinner: 6:30 P.M.

Philadelphia Room, Engineers' Club

Reservations: Call Miss Helen Yonan

IEEE Office, 594-8106 or 8134

SYSTEMS FOR SWEEPED FREQUENCY HIGH PRECISION MEASUREMENT OF INSERTION LOSS, INPUT VSWR, AND SOURCE VSWR

G. U. Sorger

Wednesday, April 19, 8 P.M.

David Rittenhouse Aud. A-4
33rd & Walnut Streets

Group on Instrumentation and Measurement

Mr. Sorger is Director of Research at Weinschel Engineering in Gaithersburg, Maryland. Three high precision methods are described for making swept-frequency measurements of insertion loss, input VSWR of one-port and two-port devices (such as the residual VSWR of slotted lines), and source VSWR in coaxial systems. The accuracy achieved is comparable to that obtained at fixed frequencies. Frequency sensitivities of detectors, attenuators, power dividers and other components normally limiting the accuracy of swept frequency measurements are overcome by using difference techniques.

Dinner: 6:30 P.M.

Pagano's, 3633 Walnut Street

Reservations: Call Miss Helen Yonan

IEEE Office, 594-8106 or 8134

COMPUTER CONTROLLED GROUND CHECKOUT EQUIPMENT

P. N. McCabe

Thursday, April 20, 8 P.M.

David Rittenhouse Lab., Aud. A-2
33rd & Walnut Streets

Group on Aerospace and Electronic Systems

Mr. McCabe is Program Manager for the Central Processor and Controller (CENPAC) which will provide automatic checkout of the line replaceable units of the F-111 Avionics Systems. This mil-spec system includes a one (1) megacycle clock computer with 16,000 words of four (4) microsecond memory and 140,000,000 bits of bulk storage. With all of the test programs stored in bulk storage, CENPAC can handle up to ten test stations independently and simultaneously.

Dinner: 6:30 P.M.

Faculty Club, 36th & Walnut Streets

Reservations: Call Miss Helen Yonan

IEEE Office, 594-8106 or 8134

SYMPOSIUM-DATA LOGGING SYSTEMS FOR CENTRALIZED CONTROL

Panel

Friday, April 21, 7:15 P.M.

Engineers' Club Auditorium
1317 Spruce Street

Joint Meeting with the Technical Group on Marine Transportation and the Philadelphia Section of the Society of Naval Architects

The panel will include representatives of Maritime Administration, General Electric Company, Bailey Meter Company, Keinath Instrument Company, Lykes Brothers Steamship Company and Mobil Oil Company. The Coordinator will be Mr. G. A. Uberti of the J. J. Henry Company, Inc.

Cocktails: 5:45 P.M.
 Dinner: 6:15 P.M.
 Reservations: Call Miss Helen Yonan
 IEEE Office, 594-8106 or 8134

NOTE: The following members have been nominated for officers to serve during 1967-1968:

Chairman: W. E. Schmid, Sun Shipbuilding Corp.

Vice Chairman: R. G. Lepone, New York Shipbuilding Corp.

Secretary-Treasurer: F. Praissman, Philadelphia Naval Shipyard.

Additional nominees will be accepted and elections will be held at the May 11 meeting.

SHIPBOARD ELECTROMAGNETIC COMPATIBILITY, Part II
Group Discussion
Moderator: J. J. Stewart
Saturday, April 22, 8:45-9:00 A.M. (NOTE NEW TIME)

MEET-THE-ENGINEER Radio Program

This is a continuation of the program scheduled for April 8, 1967.

The program will be broadcast on WFLN-900 KC/AM and 95.7 MC/FM.

LARGE SPACE ERECTABLE ANTENNAS (Tentative)
Charles M. Kelly (Tentative)
Thursday, April 27, 8 P.M.

Holly House
Route 130, Pennsauken, N. J.

Group on Antennas & Propagation/Microwave

Theory & Techniques

Mr. Kelly is Manager of Advanced Antenna Engineering at Goodyear Aerospace Corporation, and will discuss the recent advances in the design of large space erectable antennas.

Dinner: 7:00 P.M.
 Holly House

Reservations:

Miss Helen Yonan	or W. Kinhead	or W. Lind
IEEE Office	General Electric	AEL
594-8106	969-6383	822-2929 or
		CH 7-0120

COMPUTER GRAPHICS IN ENGINEERING
Tuesday, February 7, 1967 meeting rescheduled for either September or October of 1967. See future issues of the Almanack for further details.



"LEARN!"

© RCA Electronic Age, Winter 1966/1967



"I must warn you, gentlemen, it's in quite an early stage of development."

© RCA Electronic Age, Winter 1966/1967

QUO VADIS OCR

By B. T. Daniels, *Guest Editor*

Senior Methods and Procedures Analyst, Data Recognition and Industrial Control Department C & E Division of Philco-Ford Corporation.

In spite of the fact that the sophistication of the computer industry have for some years been hypothesizing about an all-electronic society in which paper will no longer be needed—the fact of the matter is that we will be using paper as the vehicle for recording, transmitting, encoding, and generally handling information for many years to come.

There are numerous schemes for getting around the tedious and expensive business of manually encoding information for input to computers and many of them have been eminently successful in the solution of specific problems (for example MICR in the banking industry, bar code scanners for credit cards). In the near future speech recognition and remote terminals which permit keyboard entry to large time sharing systems will prove to be powerful tools, but again for the solution of specific problems. Optical character recognition is still the most promising general approach to source data automation.

Today approximately 500 OCR systems are installed in the United States.¹ With few exceptions, these systems were designed to satisfy the processing requirements of specific applications. In fact, applications and system design efforts have been most frequently defined and limited by the state of the art. In the late 1950's the art, practically speaking, could deliver one or two-line, stylized font scanners.

Recently released equipments, however, have a wide range of capabilities which have yet to be exploited. This article briefly surveys these capabilities, present and future, and attempts to point out the applications and related extra-machine problems.

¹ Estimate made by Mr. J. F. Cunningham, head of a new ADP Management Branch within the Office of Management and Organization, U. S. Bureau of the Budget, at the Source Data Automation Symposium, May 9, 1966, in Washington, D. C.

Applications may generally be grouped in three broad classifications:

1. Real-time process control
2. Information retrieval
3. Business oriented data processing systems

Real time process control refers to systems wherein the information read permits a decision to be made and action taken. Information retrieval applications would typically involve file conversion for input to and subsequent retrieval from the computer system. The retrieval may be accomplished with encoded film packs sent to the field, or via computer printout or display.

Business oriented data processing systems vary tremendously in scope from the single-line information on an invoice which is generated by computer and scanned when it is returned to a central location, to systems which must adapt to field-generated multi-font, multi-format data.

A wide range of equipments is available to accommodate these applications.

In Real-Time Process Control:

U. S. Post Office mail sorting is a prominent application of OCR to real time process control. The address on the envelope is read, a decision made, and action taken in one continuous operation. The address readers must read multi-font alphabets and numeric addresses in addition to ZIP codes in order to sort machine printed mail which can be addressed in any one of hundreds of fonts with very minimal format restrictions. Thus these machines use not only advanced multi-font recognition techniques, but also context and format recognition. Information concerning the characteristics of live mail has been augmented considerably by the pilot system in the Detroit Post Office, and future systems will sort not only outgoing but incoming mail to zone and carrier, by ZIP code or street and street number.

Non-constrained hand print readers (i.e., numeric script) which will recognize the ZIP codes on handwritten letter mail are currently under development in the laboratory.

Techniques are being developed in several laboratories which will permit the use of optical character recognition in industrial control applications, for example checking labels on bottles during packaging processes and material control on assembly lines. These techniques are aimed primarily toward accuracy and speed since the industrial environment lends itself to a certain amount of control where font and print quality are concerned.

In Information Retrieval:

The military has implemented several information retrieval systems which use OCR equipment for conversion of historical files. One such system has the capability of recognizing and encoding 163 characters, including upper and lower case alphas, numerics, control symbols, Greek, mathematical symbols and underlined characters. To augment such systems the military establishment has sponsored in-depth studies of error correction techniques, including the use of spelling correction schemes, English-English dictionaries, improved proof-reading and data re-entry techniques. Microfilm scanners are being investigated in the laboratory, and hold great promise in the information retrieval field.

In Test Scoring:

The test scoring devices in the field are "mark" readers, so that either the student must mark out his name in a series of boxes which is time consuming and error-prone, or his name and attendant alpha information must be manually encoded. One of the principle testing services is currently having a constrained alpha-numeric hand print reader built to expand and streamline this operation. Alpha-numeric hand print readers will probably, in the near future, permit economies in survey work of many

types, as mark sense can be expensive whenever the worth of the individual's time, and the cost of inaccuracy, are taken into account.

In Commercial Business Systems:

The range of equipment capability is widest in this area. Because many business systems can be completely controlled, it is in this area that early OCR equipment was first used. The early machines were limited in recognition capability, and were generally aimed at large-scale "turn-around" paperwork which could be processed by a one- or two-line single font reader.

Practical commercial systems of the following categories are currently being used:

Mark Sense

Single-font, single line

Single-font, two-line

Single-font, full page

Single-font Mark Sense, full page, programmable format

Multi-font Mark Sense, full page, programmable format

Constrained hand print, numerics only

Constrained numeric hand print one or two fonts mark sense

Constrained numeric hand print multi-font mark sense

Constrained alpha numeric hand print

These machines are being put to work on applications so numerous, so different, that it is impossible to go into specifics in a magazine article. But nevertheless, applications work has barely begun.

If one takes into account the techniques currently in development, the applications possibilities expand still further. Some of the new programs are:

Fingerprint recognition, under study at the Federal Bureau of Investigation.

Non-Constrained numeric script, under a study assignment from the U. S. Post Office.

Industrial Control Applications, under study in several major corporations.

Format Recognition, which has been under intensive study at RADC.

Context Recognition, being investigated by several government and industrial groups.

Holographic Techniques which show promise for certain highly complex alphabet structures, such as Chinese.

Speed and accuracy are the predominating factors which determine the economic advantages of OCR but unfortunately neither is easily defined. Both are dependent upon extra machine factors.

Good input quality, format control, and document preparation seem too obvious to mention, but are frequently forgotten or ignored. The Business Equipment Manufacturers Association and others have been working toward standard stylized font design, print quality definition, paper quality definition, and these efforts will have particular significance in certain controlled-environment applications.

In multi-font work, we have obtained accuracies better than 1 error in 250,000 characters (numeric data, "good" input quality), with a throughput of more than 1,000 characters per second. This should show that OCR, given proper system planning is capable of delivering hitherto unapproached speed and accuracy. That one erroneous character in the 250,000 could be corrected in most cases, by the way, during subsequent data checks.

It is very difficult to make a valid comparison between OCR and key-punch accuracies. In the literature keypunch undetected error rates of 1 in 1,600,² 1 in 2,000,³ 1 in 4,300³ characters have been quoted, with detected error rates estimated at 4 times the undetected error rates. It is not the intent of this article to go into a detailed analysis of the data, but it should be pointed out that the character sets in OCR (considering for the moment only alphas, numerics and specials) are generally much wider than the character sets used in keypunch operations which are largely numeric. In scientific English text one experimental keypunch operation yielded an accuracy

² E. T. Klemmer and G. R. Lockhead, "Productivity and Errors in Two Keying Tasks: A Field Study," *Journal of Applied Psychology*, 1962, Vol. 46, No. 6, 401-408.

³ E. T. Klemmer and G. R. Lockhead, "Further Data on Card Punch Operator Performance," *Research Note*, Thomas J. Watson Center, Yorktown Heights, N. Y.

rate of 96.7 percent before and 98.7 percent after proofreading.⁴ This was, however, "degraded" material, i.e., less legible to the human reader than would have been desirable.

Correction routines and data entry schemes are vital parts of any computer input technique. The scanning sub-system may read and translate the data but checking features both during and subsequent to scanning are mandatory. On-line displays, context or redundant information, data checking, are being increasingly used, and all will improve OCR performance.

In order to do a comprehensive system study it is necessary to have a thorough understanding of the capabilities and limitations of OCR. It is tempting to view OCR as a vast key-punch replacement, and indeed it is, but it is also much more.

Perhaps it is because OCR is still relatively new, that pre-installation system studies and performance evaluations have a tendency to appear vague. The terms that are bandied about within the industry, however, are often defined less than precisely, and this also may contribute. Some of these are:

Font — which to a printer designates all of the characters available in a given face and size, but which in OCR has a variety of definitions, depending on the manufacturer or even on the speaker of the moment.

Print Quality — a term for which there is no universally accepted quantitative definition.

Basic Scanning Speeds — which are no indication of through-put unless the paper handling, error correction, re-scan, program timing and so forth all are known, and they cannot be known out-of-context because they depend on extra-machine factors such as print quality, document size, data re-entry methods, etc.

The aforesaid are merely a few of the most common ambiguities. They are discussed here in an attempt to point out some of the problems that face all OCR manufacturers, and which will only be solved via system efforts and the knowledge and experience that is being accrued by users.

⁴ F. L. Barone, W. J. Eisner, E. J. Galli, et al, *FTD Semi-Automatic File Conversion System*, Technical Report No. RADC-TR-65-367, December 1965.

(Continued on page 15)

INFORMATION STORAGE & RETRIEVAL

By George Neborak

Auerbach Corporation

Over the centuries, man has had the problem of storing and retrieving information. Since recent technical progress has caused an information explosion accompanied by voluminous technical literature, new methods and techniques are needed for obtaining and storing this information. Both industry and government are spending millions of dollars on the development of information retrieval systems to alleviate this problem.

Originally, documents were widely disseminated, but as the quantity of material and potential readers increased, procedures changed. Many persons would not be interested in all the information, but separating those who were from those who were not could be more expensive than just making the information available to everyone. If user needs and interests could be defined, and the information content of messages described, information could be automatically sent to the end user, thus reducing redundant and non-relevant information. However, it has been difficult to ascertain users' needs since they cannot describe them adequately. The role of IS&R, therefore, is to get the right information to the right person in the right format at the right time. There have been great advances in solving many of the physical aspects of the problem since EDP equipment began coping with the increased documentation.

IS&R is most concerned with improving the communication of recorded information among three types of individuals or groups:

- (1) The originator of information — one who develops or first records information.
- (2) The indexer or librarian — one who is responsible for the proper storage of information so that it can later be retrieved and used.
- (3) The user of information — one who requires information as a resource in solving his problems.

One of the most important aspects of IS&R is learning how to label infor-

mation items so that they not only describe the material but differentiate between similar items. Another major challenge is to educate the user to ask the right questions. In many instances, the user does not state exactly what information he wants; therefore, his search proves ineffective. Either he receives too much information or the information is too general (or too specific); some of the data may not even be relevant.

The general functions of an information system are to maintain a file of data, organized so that it can be searched systematically for specific information, and to retrieve the information from the file to satisfy the needs of the users of the system. These functions are performed by all information storage and retrieval systems from the simplest to the most sophisticated. Information systems perform these general functions for a variety of users.

Thus, a scientist, who may want only to be kept informed of the most advanced and novel work being done in his field, can be included on distribution lists for information which meets carefully defined criteria. An applied scientist, who may be interested in a literature search or state-of-the-art survey in order to begin a research project without duplicating work already done, may want all information, both novel and old, which meets specified criteria. An engineer, who may be interested in solving a particular problem, may want only enough information to answer his question and not necessarily the newest or all literature on the subject. Information systems are also used for personnel selection and inventory control in the business community. Because of the diverse levels of interests of users, information systems may be designed primarily for use by any one or several interest levels.

Users, of course, strive for ease in locating information so their first source is those who are nearby. For most of our lives we receive information by ear, but information received in this manner cannot usually be re-

ferred to later. The main asset of this mode of communication is feedback, but more complex or abstract information must be written to be adequately absorbed.* To be most effective, systems must describe information to the user in such a way that he can browse for leads and search paths which may help him locate specific items of interest.

Difficulties also exist in the manner of disseminating information. Information should be characterized in such a way that pertinent information can be selected from documents and brought to the user's attention rather than forcing him to read the entire document. Information systems may be classified in many ways, some of which are as follows:

- (1) Class of Information
- (2) Subject
- (3) User Job Description
- (4) Type of Organization
- (5) Categories of Use
- (6) Mode of Use
- (7) Performance Characteristics
- (8) Form of Information
- (9) Output Media
- (10) Type of Information Stored

Each of these methods of classification may be useful for some purpose and from various points of view. From an applications point of view, these methods of classification are useful for identifying distinct markets, whereas the following methods of classification are useful from a systems design viewpoint.

- (1) Mode of Use
- (2) Performance Characteristics
- (3) Form of Information
- (4) Categories of Use.

In mode of use, all information services may be categorized as either a current-awareness or a retrospective service. Current-awareness services generally aid a user in keeping up with what is happening; retrospective

* Mooers' Law: "an information retrieval system will tend not to be used whenever it is more painful and troublesome for a customer to have information than for him not to have it."

(Continued on page 15)



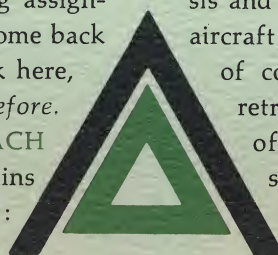
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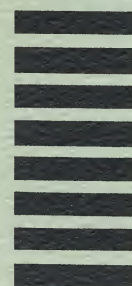
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(Continued from page 12)

services assist him in determining what has transpired in the past. Information storage and retrieval suggests a retrospective purpose since there is a search for information that has been stored.

From the viewpoint of the recipient, information systems have three major performance characteristics: completeness (recall), relevance, and specificity. Completeness refers to how many of the stored documents containing relevant information are supplied to the user. Relevance refers to how much of the information supplied to the user is pertinent to his needs. Specificity is a comparative term which refers to the degree of generality of the relevant information supplied.

There are three major forms of information: individual items, reference tools, and correlations. "Forms" has a broader meaning than format, and is more pertinent to document retrieval systems. Individual items include letters, drawings, memoranda, standards, reports, articles appearing in newspapers, journals, etc. Reference tools include abstract journals, catalogs, indexes, annotated or unannotated bibliographies. Correlations include such items as state-of-the-art reports, handbooks, and fact retrieval systems.

Usually the output of an information storage and retrieval system is in any one or some combination of the following forms: a display or a reduced or full-size copy of the document or selected pages; information about the document such as an abstract, an extract, or a bibliographic citation; an accession number or shelf location; or merely the number of answers that the user will get.

Depending on the kind of output, various purposes are served. If output is in the form of a display or copy of the entire document or selected pages, the intention is that the user peruse the documents or pages produced in answer to his search question. Such an information system must be able to distinguish pertinent from non-pertinent documents on the basis of a user's search question to avoid deluging the user with so much useless data that he cannot effectively find the information to use in his research. If output is in the

form of information about the document, the intention is that the user study the smallest amount of data which may directly satisfy his needs or which may enable him to select all the documents he may need.

Information about documents may be presented on various levels. An abstract is a brief summary of a document. It may be "informative" if it is comprehensive and contains all of the principal factual conclusions in the documents, or it may be "indicative" if it merely provides information about the existence of factual data in the document. If the abstract is informative, at best the user may get all the information he needs and may not have to refer to the complete contents of the document. At worst the user can decide whether or not he wants to refer to the complete contents. The indicative abstract can only provide the user with information to help him decide whether or not he wants to refer to the complete document.

Extracts are similar to abstracts except that extracts are direct quotations from the documents. The purpose of an extract is essentially the same as that of an abstract. Bibliographic citations include such items as the title, author, source, and date of publication. Even such brief information as this may enable the researcher to decide whether or not he wants to refer to the complete contents of the document.

When a system provides, as initial output, some information about the document, as just described, the information system need not distinguish pertinent from non-pertinent documents. Such a system is designed to provide initial feedback to the user in the form of partial information from the file, hopefully in a quantity small enough to allow him to comprehend and to decide whether or not he wants to continue the retrieval process so that he can refer to the complete contents of certain documents.

If a system provides output in the form of document accession numbers or shelf locations, the user has three choices. First, he can go directly to the contents of entire documents; second, he can obtain information (abstracts, citations, etc.) about the documents and then decide whether to refer to the entire contents. Third, he can rephrase his question and begin

the search again. The procedure is based on the assumption that the system may produce so few documents in response to some questions that the user could effectively refer directly to the entire contents without spending too much time. However, it is also possible that the system may produce so many documents in response to other questions that the user would be better off either to refer to abstracts, citations, etc., or to renew his search with a revised question.

Depending on the kind of output the system is expected to provide in response to search questions, two general kinds of information storage and retrieval systems can be distinguished: a document recovery system and an information recovery system.

If the objective is to recover a document containing information meeting search specifications, the output of the system provides a display, a reduced or full-size copy of the document or selected pages, or a surrogate such as an abstract, an extract, a bibliographic citation, an accession number, or a shelf location.

If the objective is to recover information meeting search specifications, the output of the system directly provides the selected information, such as a personal name, a list of names, or a method of doing something. This information is the end product to be delivered to the user.



(Continued from page 11)

The future of existing and future installations appears to be less dependent on the machines themselves than on the peripheral applications and systems effort expended. The computer industry has established that equipment manufacturers do not discharge their responsibilities simply by delivering hardware, and this has resulted in an increased awareness on the part of the manufacturers of OCR of the need for applications support. There has been a marked increase in the setting up of joint vendor/user systems groups with a resulting acceleration of planned applications.

Still it is not unreasonable to assume that the most significant uses of OCR in the future lie with applications presently not being done at all, rather than in replacement of other, older input conversion techniques.

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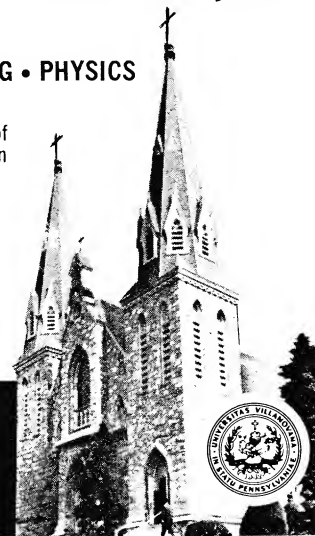
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William M. Scott, Jr., who until recently served as president of I-T-E Circuit Breaker Company, received on February 25, 1967 the highest award of the Philadelphia Section of the Institute of Electrical and Electronics Engineers (IEEE).

Mr. Scott, already an IEEE Fellow, was presented a framed certificate citing his "creativity, leadership, and inspiration which have enriched the economic, scientific, and educational growth of the Delaware Valley." He holds 60 patents that represent substantial improvements in electrical distribution and control apparatus, and is a registered professional engineer in the State of Pennsylvania.



William M. Scott, Jr., receives IEEE Philadelphia Section's highest award from John E. Snook, chairman, Philadelphia Section.

The presentation was made before more than 400 guests at the Past Chairmen's and Fellows' Night Dinner of the Philadelphia Section of IEEE at the Marriott Motor Hotel in Bala Cynwyd.

Mr. Scott joined I-T-E in 1926 and became president in 1942. He is a member of the board of directors of I-T-E, and serves on the boards of trustees of Drexel Institute of Technology, the Haverford School, and the Franklin Institute, and is a past president of the Manufacturer's Association of Greater Philadelphia. Mr. Scott is also associated with many other civic and professional organizations. He resides in Bryn Mawr, Pennsylvania.

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ELECTRONICS IN THE COMPOSING ROOM

By Dr. H. N. Crooks

Senior Member of IEEE; Manager, Product Engineering, RCA Graphic Systems Division

The Printing and Publishing Industry was one of the last bastions of almost completely mechanical production. But new electronic techniques are changing that—and changing it fast. The change really started in 1962 when the first computerized typesetting systems were put into operation. These systems incorporated editing changes and corrections and produced paper tape that directed linecasters to set copy in proper column width, automatically hyphenated and justified. It was an impressive step forward.

A year later an RCA 301 computer and the Relay Communication Satellite were tied together in a demonstration of high-speed trans-oceanic automatic typesetting. Its meaning: Electronics had given the printed word a new range and speed.

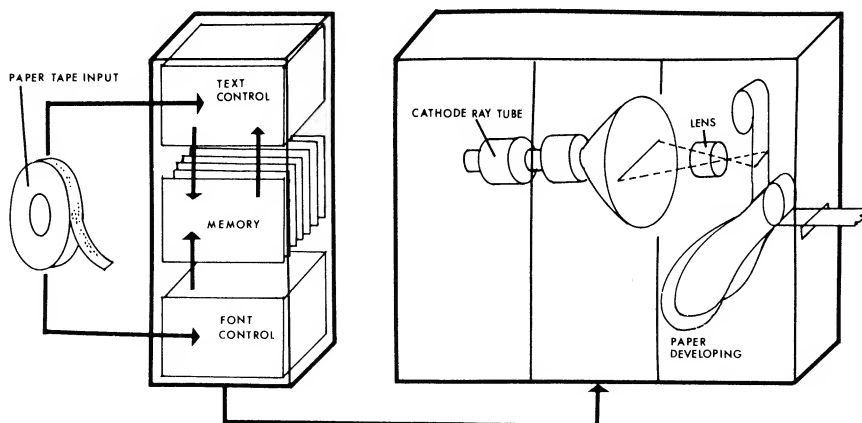
Today electronics are entering the composing room. And the introduction of these integrated systems brings us to the threshold of a potential second revolution in the printing industry.

Electronic Information

Five centuries ago movable type triggered the first printing revolution. It made more information available more quickly to more people than ever before. From that time on, the written word was the fundamental building block of our expanding knowledge.

But in this century, new electronic tools began to change the speed and nature of information. First radio . . . then television . . . then the computer. But competition from new media has strengthened, not diminished, the stature of the printed word. During this decade, the Printing and Publishing Industry has grown faster than our gross national product. The printed word remains a potent medium for moving information, ideas, or products.

In the United States alone, we are expected to spend some \$20 billion



ELECTRONIC TYPE SHOP—Here's how Videocomp's fully electronic typesetting system works. Original copy is fed into a computer, which hyphenates and justifies the text and produces an output tape. This is read by Videocomp which calls from its memory the correct characters in desired type font and size. The letters are flashed on a cathode ray tube, exposed through a precision lens onto sensitized paper or film in reproduction quality, developed, dried, and sheeted.

in 1967 on the printed word. We currently consume over a billion books, over 10 billion magazines, and more than 25 billion newspapers a year.

Through print, radio, television, telephones, and the computer, we have become the most informed and best educated generation of man. In the 20th century man's store of knowledge has doubled. We are as far removed from 19th century man as he was from the cavemen.

Meeting the Need

Today, we generate 2,000 new pages of information every minute . . . and our output is increasing geometrically. The sheer volume of our printing requirements shows the need for new techniques that let us get thoughts to the printed page more quickly and accurately than ever before. The answer is electronics.

The RCA Videocomp typesetter is one example of what electronics is bringing to the printed word.

First, speed. Today Videocomp writes at speeds of up to 650 characters a second, or 900 lines a minute. It can set all the text of a standard newspaper page in less than two minutes.

Second, flexibility. Because the characters are stored and written electron-

ically, they can be changed at will.

In Videocomp characters are stored electronically in a memory identical to a computer high speed memory—but it serves a completely different function. Videocomp's core storage is comparable to a conventional type face magazine. Fonts are stored in and retrieved from this memory. Thus, to set type we move nothing but electrons.

All Sizes and Variations

This is where flexibility begins. To have a complete set of type faces, you would need a magazine for each point size and for every variation of the type face. Thus, to have a complete selection of Times Roman, you would need at least 11 magazines just to have the standard faces in each point size from 4 to 24 points.

If you wanted a complete size range in condensed, extended, and oblique variations of the face, you would need 44 magazines. These 44 magazines are replaced by Videocomp's memory. As each character is needed to set copy, it is brought out of memory and displayed on a cathode ray tube. By setting controls, text can be generated in any size. It can be condensed . . . extended . . . or oblique at will.

(Continued on page 20)

MEMBERSHIP BUTTONS

Membership buttons will be available from the local IEEE Office and are priced as follows:

Grade	Color	Price
Fellow	Gold	\$5.00
Senior Member	Dark Blue	\$4.00
Member	Light Blue	\$4.00
Associate	Maroon	\$4.00
Student	Green	\$1.00

If you do not have a button, now is the time to get it. The local office is located at:

IEEE Office
Moore School of E. E.
University of Pennsylvania
Phila., Pa. 19104
Telephone: 594-8106 or 8134



ITEM OF INTEREST

CTC Adds DACOM Division — Mr. R. O. Endres, President, Computer Test Corporation, Cherry Hill, New Jersey, has just announced that the company has formed a new corporate division to be called the Dacom Division of Computer Test Corporation. The basis for establishing the new division was the acquisition by CTC of the Telemux product line of time division multiplexing equipment from Data Communications, Inc., Moorestown, New Jersey, a subsidiary of the Analox Corporation, Boston, Massachusetts.



MAY SECTION MEETING

**Joint with the Franklin Institute
May 3, 1967 Franklin Institute**

Dr. T. C. Tsao of Columbia University will be the speaker for the May 3, 1967 Main Section Meeting to be held at the Franklin Institute. The topic will be a timely one—"Engineering and Engineering Education in Red China." IEEE and the Franklin Institute will be joint sponsors of this meeting.

Social Hour: 6:30 Franklin Hall

Dinner: 7:00 (\$5.00)

Lecture: 8:15

Reservations are needed for both dinner and meeting. Make reservations directly to: Director of Meetings
Franklin Institute
20th & Parkway
Phila., Pa.

engineers



MECHANICAL ENGINEERS This position requires a broad background of mechanical design experience as related to electronic products. Responsibilities include design of precision test fixtures for use in memory and semiconductor test equipment, mechanical design and packaging of electronic instruments and subassemblies, specification of company standards for printed circuit boards, panel layout, systems hardware and cabinets, materials, finishes and processes.

SOLID STATE CIRCUIT ENGINEERS Research, design, development of new solid state circuits, instrumentation modules, sub-systems. Worst case (end-of-life) designs of semiconductor logic, pulse and linear circuits, analyses of transient and DC circuit performance and thermal analyses. Experience in solid state circuit design: computer and memory circuits.

MEMORY TEST SYSTEMS ENGINEERS Plans, conducts and supervises development and construction of digital test instrumentation. Analyzes requirements and designs of special circuits, such as analog-to-digital conversion, digital-to-digital interface and special switching circuits. Experience in digital systems engineering: computers, data handling systems, integrated circuit test systems or high speed random access memory systems.

IC TEST EQUIPMENT ENGINEERS New product development of integrated circuit test equipment requires electrical engineers with two to five years overall experience, one of which has been in the design of test equipment, determining test procedures, or design of instrumentation, used for semiconductor testing.

SALES/APPLICATIONS ENGINEERS Rapid sales growth and new product expansion have created immediate openings on the field sales staff offering excellent opportunities for alert, technically capable individuals. Responsibilities include direct product sales and analysis of customer requirements for magnetic memory and digital test equipment, integrated circuit and semiconductor test equipment. Desire someone with experience in sales to OEM accounts, preferably with digital systems or specialized test equipment background.

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(Continued from page 18)

High Resolution

As each character is called from memory, the stored information is converted into thousands of dots which are resolved to 50 to 120 vertical lines—or an average of 3,000 dots. This is written in a predetermined sequence of deflection orders on a high resolution cathode ray tube. As each character is written, it is directed through a precision lens and exposes sensitized film or paper.

Characters are written across the face of the tube until a complete line is formed. The film or paper then advances by preprogrammed measure and the next line is composed.

The Videocomp typesetter can hold up to eight type faces at one time. When new fonts are required, they can be read into memory to replace a face not in use. The process requires about 16 seconds by paper tape and only one second when read in by magnetic tape.

Sets Any Symbol

Type sizes themselves are only one side of Videocomp's flexibility. Because storage is electronic, any set of symbols can be read into the machine—including Cyrillic alphabet, Chinese ideograms, and mathematical and scientific symbols.

Videocomp can also change type style or size within a word and vary line lengths for such composition problems as the "run arounds" that are needed around photographs inserted within text. Certainly, video composition techniques are going to be an enormous aid. But the contribution of electronics does not end with type itself.

Electronic Color

In color printing, four plates are needed to produce full color. To produce color plates, the original color transparency must be separated into its basic components. This is done now by conventional camera techniques through filters and masks. For instance, to produce the red or magenta plate, filters and masks cut out all colors but red. To reproduce a good set of color separations this way can take anywhere from 3 to 30 hours.

However, by applying electronics we can accomplish this in as little as 35 minutes. By doing color correction, under-color removal, and high-light

masking all at the same time, electronic methods not only speed up the process, but make it possible to electronically compensate for the many variables in color printing—even for the press, paper, and ink.

The RCA Color Scanner solves many of the cost and time problems involved in color work. It scans full color transparencies and electronically determines correct color positions and intensities. This results not only in faster separations, but in more consistent quality than is possible with conventional camera and filtering methods.

Tomorrow and Tomorrow and Tomorrow

Put the computer, video composition, and electronic color separation together and you get a glimpse of the future that electronics can bring to printing.

It won't be long before it will be possible to pick from an unlimited number of fonts in seconds . . . pick any letter in millionths of a second . . . and compose full pages all automatically hyphenated, fully justified, and precisely leaded. And this

will be accomplished with the flexibility that only a computer can give. The computer will make it possible to sort, store, merge, and move type as it is needed . . . when it is needed. Through scanning techniques, it will be possible to feed the machine graphic materials too. And with line copy and half-tones already inside a computer, it is possible to have them sized and read out on a single page. They can even be displayed on a video terminal for electronic makeup. Today information is our most important commodity. Electronic composition systems are already making significant contributions.

★★★★★★★★★★★★★★★★★★★★

FRIDAY IEEE LUNCHEONS

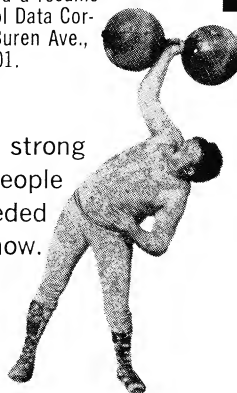
IEEE members gather for lunch every Friday at Noon. A cordial invitation is extended to you to join the group in the Philadelphia Room of the Engineers' Club, 1317 Spruce Street, Philadelphia. No reservations are necessary.

Control Data is building up strength in Valley Forge

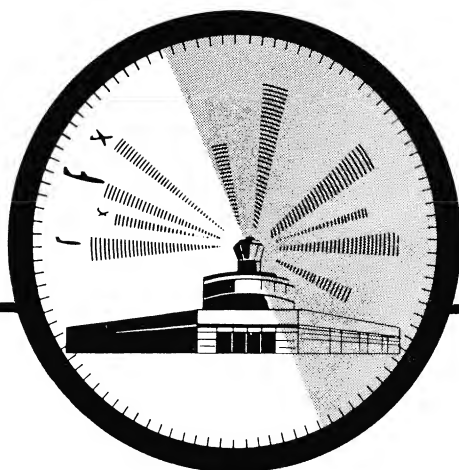
We're out to do battle with the entire data processing world—and we're out to win. Right now we're in third place and climbing fast. To keep up our momentum, we need more good, strong people. In Valley Forge, where we are developing and manufacturing card punches, card readers, and tape transports, we need above-average engineers experienced in manufacturing or design and development. What we offer is an above-average career and a full range of employee benefits. We cordially invite you to come out and see for yourself whether Control Data in Valley Forge is the place for you. For a confidential interview at your convenience, call or send a resume to: Ted Ulven, Control Data Corporation, 2621 Van Buren Ave., Norristown, Pa. 19401. Telephone 666-5000.

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THE ENGINEER'S SEARCH FOR IDENTITY

R. F. Ficchi, E. E.

Member of IEEE

The engineer as we know him today is a relatively new phenomenon. He only appeared on the scene about 75 years ago and one might say that he is the product of the Industrial Revolution. Historians, such as L. S. DeCamp in "The Ancient Engineers," start out by saying "Civilization as we know it today owes its existence to the engineers. These are the men who down through the centuries have learned to exploit the properties of matter and the sources of power for the benefit of mankind." But the engineer, here referred to, is primarily the Civil Engineer, the Structural Engineer, and the Architectural Engineer. These are the men responsible for the great engineering works for the first 19 centuries of our era. It was the engineer, indeed, who advanced civilization but not in an environment which by any stretch of the imagination resembles our own. The contemporary engineer has no professional connection with these engineers. Especially among the electronic engineer, our professional heritage begins with Thomas Edison. And it is interesting to note that in many instances even the work of such people as Edison is denigrated by the over-simplified comment: "Well, that was great in those days but today we need teamwork."

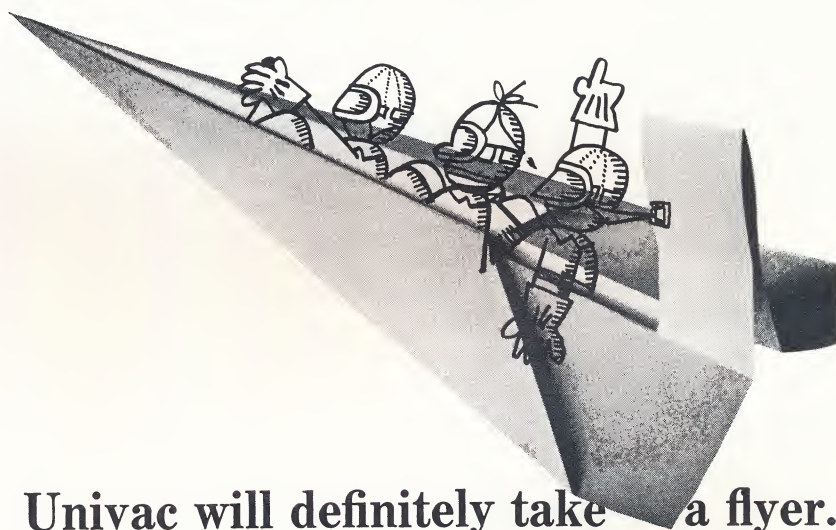
The contemporary engineer cannot look for identification with a broad historical heritage. (In fact, no one in engineering schools pays much attention to any of these questions.) We in the engineering business simply do not have a Hippocratic Oath which one sees in every physician's office and which provides the physician with a rule of ethical conduct, framed above our desks. We

may have a "Zero Defects" award, not so much an individual achievement but a recognition of the individual *and* his group for having made the fewest "klinkers." The engineer is inexorably tied to his group whether he likes it or not.

A further complication in the search for identity is that a country such as the U.S., with its broad democratic base, has the criterion for judging a man as on his worth as an individual. This eliminates the identification with a particular social class or ethnic group. Social classes such as the gentry and ethnic groups such as recent immigrants are fast disappearing, due to the broad social gains of the past 30 years. No engineer can look for

identity either as a member of a social class or of an ethnic group. Such a search would be contradictory. Numerous and more complex examples can be used to further support this analysis.

Where then can identification be sought by the engineer? In one common experience which all engineers can claim and the place where he has been judged strictly on his merits. This place is his university. It is the engineer's common experience and provides him with a heritage which can be the transformation of his work into that of a bonafide professional with a spiritual and cultural heritage that can give him a unique place in contemporary society.



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ITEMS OF INTEREST

National Data Banks and Privacy — Rep. Cornelius E. Gallagher will discuss "National Data Banks and Privacy" in his keynote address before delegates to the Spring Joint Computer Conference on April 18.

The New Jersey Congressman is the leading spokesman of a growing movement concerned with maintaining individual privacy in a world of miniature electronic detection devices and high-speed computers that help business and government collect and store information in increasing quantity and detail.

As a member of Congress for the past eight years and Chairman of a special Subcommittee on the Invasion of Privacy, Rep. Gallagher has expressed special concern over establishment of a National Data Center as proposed by the U.S. Bureau of the Budget.

Under the proposal, information collected by some 20 Federal agencies — including the Internal Revenue Service, Bureau of the Census, FBI, Defense Department, and the Civil Service Commission — would be fed into a single set of computers for easy access.

After hearing testimony last summer from experts who said the Data Bank could be converted into a Personal Dossier Bank, Rep. Gallagher said, "if the possibility of such a conversion is not overcome, then surely the bank, in time, could seriously erode our traditional right to privacy. It should be apparent to anyone the great power that would exist behind the Federal official who has the authority to push the button that would produce such a dossier."

This wasn't the only facet of the Data Center that bothered Rep. Gallagher.

"We are also concerned," he said, "with the threat which a Federal Dossier Bank represents to the right to make amends for mistakes and begin again. Men can forgive and forget, but a machine cannot."

"In the future, no responsibilities of our government will be greater than preservation of privacy and protection of our fundamental human values," he added.

Following his keynote address, Rep. Gallagher will lead a three-man panel discussion on the "Privacy Problem." Other members of the panel will be the session coordinator, Stanley Rothman of TRW Systems, Inc., and Professor Alan F. Westin of Columbia University.



IEEE PEOPLE IN THE NEWS

IEEE Names J. W. Backus for 1967 McDowell Award—John W. Backus, IBM Fellow, has been named as recipient of the 1967 W. W. McDowell Award of the IEEE Computer Group. The award, the second in an annual series, will be presented to Mr. Backus at the Spring Joint Computer Conference at the Banquet on the evening of April 19, 1967 in Atlantic City.

Mr. Backus was selected for this award for his early and continuing contribution to the field of higher level languages, in particular for his conception and leadership resulting in the completion of the first FORTRAN projects; and for his work in syntactical forms incorporated in ALGOL.

Mr. Backus' concern with higher level languages dates back to the IBM SSEC computer in 1948. Spurred by the difficulty of programming that machine, he was instrumental in preparing an interpretive system for the IBM 701. After these early endeavors Mr. Backus prepared specifications of the FORTRAN language and led the group which prepared the version which became available for the IBM 704 in 1954.

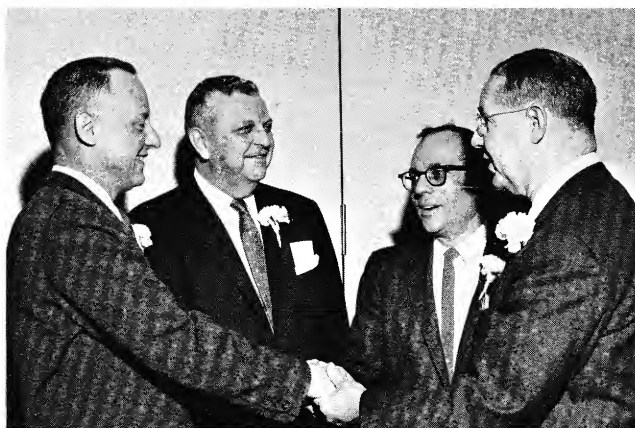
In addition to his work on FORTRAN, Mr. Backus also made strong contributions to the development of the International Algorithmic language which eventually became known as ALGOL. The so-called Backus, or Backus-Naur, form of a language has been a formalizing tool greatly aiding the development of ALGOL.

John Backus is at present on a five year appointment as an IBM Fellow, in which capacity he is now associated with the Electrical Engineering Department of the University of California at Berkeley.

NEW MEMBERS

We welcome the following new members into our Section:

N. A. Ali	O. C. Keil, Jr.
A. Alma	H. L. Keller
C. G. Arnold	L. K. Kling
W. K. Bennett	D. B. Knies
C. W. Blades	J. E. Knights
D. Bosse	R. L. Layman
R. H. Brandt, Jr.	M. E. Leistikio
J. W. Brown, Jr.	J. P. K. Lo
J. C. Bouse	S. L. Love
J. W. Byerly	H. R. Lumma
P. J. Callen	R. C. Markelwith
X. Caro	W. P. Meeham
L. P. Chu	A. G. W. Miller
M. W. Cornforth	E. E. Mortlock
M. E. Conway	J. W. Murphy
L. P. Costa	W. C. Musto
T. M. Dahl	R. E. Osteen
R. DeMoyer, Jr.	N. J. Owan
C. Diefenderfer	F. E. Papke
H. S. Dreyer	V. K. Rasmussen
F. J. Dougherty	M. Richman
G. P. Esmer	S. Rosenberg
G. D. Face	T. M. Schenck
C. H. Fernstrom	O. W. Schmauk
W. G. Fisher, Jr.	W. T. Schalleur
R. Frank	W. A. Sheridan
J. J. Franklin, Jr.	R. E. Simmons
D. M. Frederick	A. Socolovsky
W. E. Glasby	G. F. Sokol
W. G. Granat	M. T. Talarovich
N. Goldberg	F. H. Tribolet
B. Green	M. M. Truex, Jr.
A. Guran	E. C. Uphoff
R. H. Hainsworth	A. C. Vecrumba
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J. P. Hatfield	Z. M. Wisniewski
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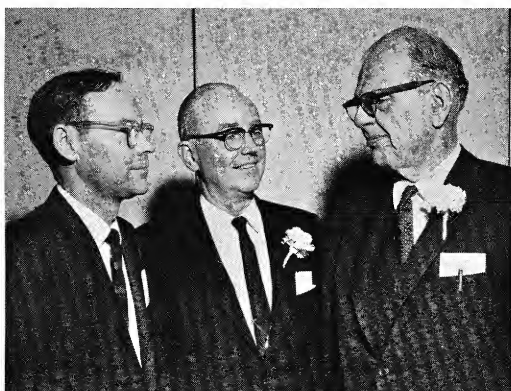
Harris O. Wood, William G. Amey, Ezra S. Krendel and Alexander R. Applegarth, Jr. New IEEE Fellows.



Walter E. Scholz, Harris O. Wood, William G. Amey, William M. Scott, Jr., Ezra S. Krendel and Alexander R. Applegarth, Jr.



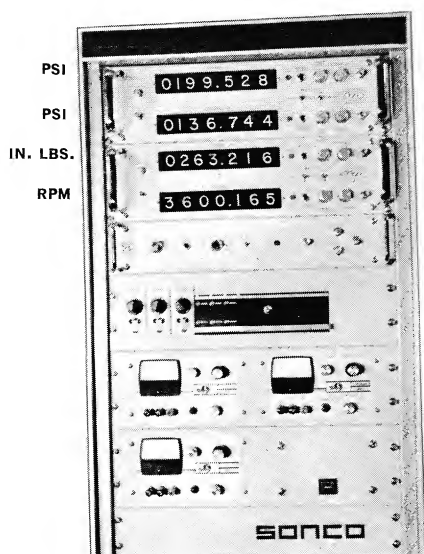
William M. Scott, Jr., receiving the 1967 Award from Chairman John Snook.



John E. Snook, Chairman Philadelphia Section IEEE; Walter K. MacAdam, President, IEEE; and William M. Scott, Jr., Former President of I-T-E Circuit Breaker Company.



Walter E. Scholz, receiving the Philadelphia Section Service Award from Chairman John Snook.



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NJE Corporation	<i>Burlingame Associates</i>
Patwin Electronics	<i>Jack McCoy</i>
Phaostron Instrument & Electronic Co.	<i>Jerry Bresson Associates</i>
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Sigma Instruments, Inc.	<i>Babcock-Bohaker-Stiddard</i>
Siemens America Incorporated	<i>J. A. Maguire & Co.</i>
Singer Company—Metrics Division	<i>Burlingame Associates</i>
Solitron Devices, Inc.	<i>Jerry Bresson Associates</i>
Systron Donner Corporation	<i>Burlingame Associates</i>
The Metal Etching Corporation	<i>J. A. Maguire & Co.</i>
Velonex	<i>Burlingame Associates</i>

(Continued from page 3)

Nearly 250 computer experts from 20 states and five foreign countries, including a representative from the Soviet Union, will speak or participate in the discussions and demonstrations, Mr. Chinitz said.

A highlight of the three-day conference will be a special panel discussion on "Management Information Systems."

Another session, expected to attract wide interest, is one entitled "Aspects of Computer-Assisted Instruction." Following presentation of technical papers on Wednesday morning, April 19, Dr. Duncan Hansen of Florida State University, Dr. Sylvia Charp of the Philadelphia Department of Education, and Mr. Donald Frush of IBM Corporation, will join the authors in a panel discussion of the subject.

Dr. Hansen will also address a special ladies session on Thursday morning, April 20, where he will discuss "Computers and Children," explaining computer-assisted instruction, its future, and its effect on education.



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